Electricity and Magnetism Unit

Hour # 1 Basic Properties of Electricity and conducting and nonconducting materials

- What is Electricity
- What are sources of Electricity
- What is "Static" electricity
- What is meant by "flowing" electricity
- Explore Conducting vs. nonconducting materials

Equipment and accompanying Experiments and Demos:

- Van De Graff generator - use to illustrate static electricity (accumulation of charge)
- Balloons - use to demonstrate electrical charges, attraction and repulsion
- Multimeter or continuity tester to test misc. materials for conductance of water (multimeter works really well for this experiment)

Hour # 2 Electric Circuits

- What is an Electric Circuit?
    - Use water fountain analogy
- Symbols for elements of a Circuit
    - Battery
    - Wire
    - Switch
    - Resistor
- What is the function of each circuit element
- Voltage and Amperage
    - Water flow Analogy for Voltage <-> pressure and Current <-> flow
- Constructing serial and parallel Circuits
    - Concept of a complete circuit
    - Explore voltage drop for several elements in series

    - Construct Parallel Circuits
    - Short Circuits
    - Circuit Worksheet

Equipment and accompanying Experiments and Demos:

- Batteries, battery holders, lots of wire, light bulbs and holders

Hour # 3 Introduction to Magnets and Electromagnets

- What is magnetism
- Natural Magnets
- North and South Poles (and the behavior of)
- What materials are magnetic
- Seeing magnetic lines
- Shielding magnetic lines
- Making and unmaking material magnetic

If time permits:

- How can we create a magnetic field using electricity?
- Make and electro-magnetic **Warning: If the wires are too short they will get really hot!**
- How do you make it stronger?

Equipment and accompanying Experiments and Demos:

- Batteries, battery holders, lots of wire, large nails
- Iron filings, lots of bar magnets, blank overhead sheet, overhead projector

Hour # 4 Review and electric motors

- Review all previous concepts
- Demonstrate generator
- Electricity motors.
    - Discuss the interaction between a permanent magnetic and an electro-magnet
    - Build a simple motor

Equipment and accompanying Experiments and Demos:

- Hand held generator

What Makes a Motor Work?

Materials:

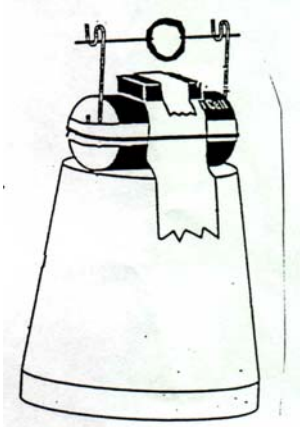
- Styrofoam cup
- 1.5 volt battery
- 2 paper clips
- 1 meter winding wire
- small disk magnet
- steel wool
- masking tape
- piece of scrap wood (2"X4")
- Make the winding around something about 3/4" to 1" in diameter.
- Use about four turns any more than that will make it too heavy.

Directions:

1. Wrap your wire around the scrap wood or other object to make a tight soil. Leave several centimeters of wire free at each end of the coil. Loop each of these ends around the coil as shown to hold the coil together. Use the steel wool to remove insulation from the ends of the wire.

2. Place the cup upside down on the table.
Lay the battery on top of it and tape it
securely to the cup.

3. Tape the magnet to the top of the battery.



4. Bend the paper clips, as shown, and tape one to each end of the battery.

5. Carefully lay the coil of wire across the paper clip supports, making sure that the stripped ends of the wire touch the clips. If nothing happens, give the coil a little spring. RECORD your OBSERVATIONS._____

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6. The device you have made is a motor. Can you suggest some practical uses for it._____

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7. PREDICT ways that you could change your motor to make it spin faster._____

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